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THE NEW REAPS PROGRAM  
FOR U. S. SHIPBUILDERS

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The primary purpose of this discussion is to introduce a new version of the REAPS Program. This new concept was first announced in the December 1975 issue of our REAPS Technology Bulletin. At that time we received several shipyard inquiries concerning the new program. Since then we have carried on a continuous dialog, and the new program has taken a definite form as a result of the discussions with those interested yards. I would like to review here the details of that form as we visualize it today.

To properly lay the groundwork for such a discussion, I will briefly review the old REAPS program and how it has achieved its current level of success.

In 1971 a MarAd sponsored U.S. Shipbuilding Industry Advisory Group recognized a void in the area of computer aided shipbuilding. Acting on the advice of this technical advisory group, MarAd acquired rights to the AUTOKON-71 system. At that time, this was the most widely used system, active in more than forty (40) European shipyards.

This action closely parallels the actions of the U.S. Air Force in 1949, when the Air Force in concert with the aerospace industries contracted with MIT for the initial development of numerical control. Subsequent to the development of that technology, the manufacturing industry still did not recognize or accept its potential. Only after the Air Force in 1955 purchased 100 NC machines and strategically placed them in several plants was numerical control accepted. There are many in the NC field today who believe that we would not have NC were it not for the early government effort to reduce the risk and prove the concept to the private investor.

MarAd and the participating shipyards recognized the need to provide maintenance and support for the AUTOKON-71 system, just as the government and the aerospace industries recognized the need to support the APT NC programming system. IIT Research Institute was

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the prime contractor for maintaining the APT system. That effort was sponsored and paid for jointly by the industrial users and the government. In view of that program experience and, I'm sure, other considerations, IITRI was chosen to provide the maintenance and support for the AUTOKON-71 system.

Much of our early effort was devoted to updating and rewriting the documentation of AUTOKON-71 for American users. This also included the documentation of new enhancements being developed by the participating shipyards and IITRI.

Additionally, procedures were established for maintenance of the software. IITRI established a base U.S. version, and all system failures were duplicated on this system. Subsequent fixes were developed, documented, and distributed.

It soon became apparent to all concerned that there was much more to be gained from computer applications in the shipyard than just running the AUTOKON system. A total shipyard program for computer automation beyond AUTOKON was needed if we were to fully exploit and control the power of the computer in ship construction. It was this decision that gave birth to the Research and Engineering for Automation and Productivity in Shipbuilding (REAPS) program; a joint participation program involving five shipyards, MarAd, and IITRI. Its purpose was to identify and address common problems in ship construction. The advantages of such a program are obvious. Participants could pool both the technological know how in identifying and solving problems and their resources to solve a common problem only once not repetitively at every shipyard.

Now under one umbrella (REAPS) we had all we needed to prove the concept:

- Ž Long Range Planning to provide a set of problem definitions and a sense of direction,

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- Software developments with an already functioning software support and maintenance system to resolve those problems.
- Hardware developments with a supporting library to house and distribute specifications and instructional material to shipyards other than the developer.

During this time our original software support was continuing but diminishing in magnitude because the early bugs in the system were already eliminated.

Our REAPS Technology Bulletins were being distributed to the entire shipbuilding community and data from our library was being requested and used by many shipyards.

The REAPS program, a new concept in cooperative developments among several shipyards, was working. The participants were discussing common problems and mutually developing best possible solutions. It has become an ideal example for other industries. It had taken the best elements of the Air Force concept with NC and improved on the concept.

However, there was one thing that was changing--the objectives of our development projects. Originally, they were oriented to a specific computer system; now they were becoming non-system oriented, stand-alone modules with no relationship to a specific computer system or software package. Examples were an NC frame bender that any shipyard could use regardless of its computer system; a pipe digitizing system; a set of standards for U.S. shipyards for holes, cutouts, structural joints, etc.

While REAPS was successful, the benefits from the program could be vastly increased if more shipyards were participating. Also the addition of more shipyards would bring more shipbuilding knowledge to bear on the problems and solutions. A new concept was needed.

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The "new" REAPS program as it has evolved to date is a non-systems oriented program. It is structured to not only embrace but benefit all shipyards, enhancing the probability of transferring common technology across a wider base of U.S. shipyards.

The first step in this new concept was the separation of all AUTOKON related activities from the REAPS program. These were totally removed and repackaged for the AUTOKON yards. Support will continue just as it always has but as a totally separate package. The REAPS program must be purified to encompass only stand-alone automation modules.

Specifically, the new REAPS Program as we see it today, (and it is by no means cast in concrete) contains what we believe are the best elements of the old REAPS Program without the AUTOKON related activities:

- Advance Planning for the proper identification of targets for a development program,
- Technology Assessment of industries and technologies on a world-wide basis that will benefit all U.S. shipyards,
- A Development Program that will address the long range planning targets through a series of projects that either adapt other industrial technology from the assessment stage or fill a technological void,
- **A Technology Information Service that will keep all shipyards abreast of developments internal and external to the program,**
- A Discretionary Development Program that can respond quickly to the participants requirements for small development efforts.

The following is a more finite description of each of these basic elements. Advance planning is not only the quantification and qualification of development needs, it also involves forecasting of inter-

relationships between development efforts. The elimination of a problem at one stage of ship construction may well create several other problems at other stages.

Advance Planning, as it is visualized today, involves the identification of critical activities. This is done through a series of interviews with shipbuilders at several shipyards. This can be viewed as the identification of potential problem areas or targets of opportunity. When these have been quantified and qualified the next step is to develop the framework of the technical approach to the solution. The final step is to make a map of the plan as conceived to this point with the objective of determining the impact of each technical approach on all other elements in the shipyard. After several iterations the impacts should be significantly reduced or eliminated completely. The result is the Advance Plan on which the REAPS Program can act.

IIT Research Institute, like other independent research and development organizations, has a wide exposure to a broad variety of industries and technological innovations, for example, a 600"/min. computer controlled wood router currently being introduced into the furniture industry. Such a device might have application in the mold loft. Whether it does or not isn't significant here. What is important is the broad base of technological innovations that is available to the shipyards.

The Technology Assessment function of the new REAPS Program is designed to capitalize on this broad base of exposure and capture elements of interest to the shipbuilding community. This activity will respond to a request from a shipyard for technical information relative to a particular problem (i.e., a faster more reliable method for making steel plates). This same kind of a request might also come from the Advance Planning Activity. In either case, the industries where similar problems might occur or potentially useful technology might exist are searched to identify potential solutions. These are then analyzed carefully to determine their applicability to the shipyard environment.

Factors such as scale-up, adaptability, skill required, transfer cost, etc. are analyzed to determine the form of any subsequent recommendation. Final recommendations may take one of three forms. First, there may be a problem solution that is directly transferable and need only be purchased and installed. This form would simply be a purchase specification. Second, there may be a problem solution that needs some adaptation for the shipyard. This form would be a purchase specification supplemented with a technical description of the adaptation required. Finally, there may be a total technical void for the problem under consideration. In this case, the form of the recommendation would be a summation of technological approaches that appear feasible. Any one of these recommendations would be communicated directly back to the shipyard for their subsequent actions.

We recognize that the shipyards do not have a full time staff of engineers available to follow up on these recommendations. Someone in the shipyard who already has a full time job will have to take on this activity in addition to his present load, if the problem is to be resolved.

Consequently, we have structured the development program so that our staff will provide full support to your engineers in developing and preparing the necessary project briefs and abstracts necessary to get the project approved and funded by MarAd. Additionally, if outside subcontractor assistance is required to perform the development work we will assist in that effort also. At the shipyards' discretion we will monitor the work and keep the entire REAPS group informed through the preparation and dissemination of progress reports. At the conclusion of the project, we will prepare all final documentation for storage and dissemination of the information, assuring that sufficient data and intelligence are captured for subsequent implementation assistance at another shipyard.

Dissemination of information collected throughout this entire new REAPS program is paramount to its success. There is minimal productivity

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gained unless the information is available to all participants.

Consequently, we believe that the Technology Information Service function is a significant pacing factor in productivity improvements. This will consist of a library where technical data from the REAPS Program and from other sources (i.e., trade journals, technical societies, etc.) is stored, maintained, and disseminated on a regular basis. We will continue to publish the REAPS Technology Bulletin on a regular basis and, if it proves necessary or advantageous, we will increase it in size and frequency. Meetings such as the REAPS Symposium are another vehicle which will serve well to disseminate timely information.

From time to time problems are identified by our participants that need a quick fix. The new REAPS program will contain an element called Discretionary Development which will address this area.

IIT Research Institute in concert with individual technical representatives from each of the participating yards will generate a suggested list of development projects. These ideas will be assembled, developed, refined, and priced out by IITRI. The shipyards collectively will select and prioritize from this list. Within the constraints of available funds, these projects will be performed and reported on in much the same manner as the other REAPS development projects and implemented at one of the participating yards to prove the concept.

To summarize, the overall concept of the new REAPS Program consists of the basic elements that have just been described: Advance Planning, Technology Assessment, Development Program, Technology Information Services and Discretionary Development. As mentioned earlier, it is not cast in concrete; it is still conceptual. However, within the next year, it will be an on-going program. We welcome your comments and questions since only through interaction with the shipyards can this be a program for all shipyards by all shipyards.

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